

Menoufiya University
Faculty of Engineering
Shebin El-Kom
Final Term Exam (Second Semester)
Academic Year: 2012-2013
Date: 4/6/2013



Year: Third
Department: Mechanical Power Eng.
Subject: Air Pollution from Combustion
Time Allowed: 3 hours
Max. Grade: 70 marks

This exam measures ILOS no.: (A6, A11, A18), (B5, B9, B10), (C15), (D1, D2)

Answer the following questions:

First Part

Question (1)

- 1.1 What is air pollution? Specify the types of air pollution. (3 marks)
- 1.2 Explain in details the global warming phenomenon. What are the main gases that participating in this phenomenon? (3 marks)
- 1.3 Distinguish between primary and secondary pollutants? Give two examples. (3 marks)
- 1.4 Convert 0.2 ppm (vol) CO₂ and 0.25 ppm (vol) NO₂ to $\mu\text{g}/\text{m}^3$ at 25 °C and 760 mm Hg. (3 marks)
- 1.5 What is meant by crankcase blowby? How it can be controlled? (3 marks)

Question (2)

- 2.1 Explain the following terms:
 - (a) Catalytic converter
 - (b) Fumigation(5 marks)
- 2.2 Discuss the emissions from diesel engines. Explain the factors that affect emissions concentration? (5 marks)
- 2.3 What are the types of smoke in diesel engines? And what are the ways of controlling it? (5 marks)
- 2.4 What is the effect of the following factors on the exhaust emission from spark ignition engines?
 - (a) spark timing
 - (b) air-fuel ratio(5 marks)

Second Part

Question (3)

- 3.1 How is the NO_x formed in the exhaust of I.C.E? What are the important engine variables that affect NO_x emission? (5 marks)

- 3.2 What are the knock emissions and how they are formed? What are their effects on environment? (5 marks)
- 3.3 Describe the working principle of NDIR (non-dispersive infrared analyzer) with the help of a schematic diagram. How is this analyzer calibrated? (5 marks)

Question (4)

- 4.1 What do you understand by the term EGR? Explain how EGR reduces NO_x emission. (5 marks)
- 4.2 S.I.E. works by hydrogen fuel. Explain in details how you can measure the concentration of emission from this engine. (5 marks)
- 4.3 Choose the most appropriate answer:
- 1- One of the major exhaust emissions from CI engines compared to SI engine is:
 A- NO_x B- UHC C- Particulates D- CO and CO_2
 - 2- NO_x emission in SI engines will be lowest during:
 A-Cruising B-Idling C- Accelerating D- Decelerating
 - 3-Photochemical smog is mainly due to:
 A- NO_x and HC B-Soot and particulate matter
 C-CO and CO_2 D- Excess O_2
 - 4-Alcohol is the major source for the emission of:
 A-HC B-Aldehydes C- NO_x D-Soot
 - 5-Smoke in CI engines is noticed during:
 A-Starting and idling B-light loads
 C-Heavy loads D-Acceleration
 - 6--Thermal converters cannot reduce emission of:
 A-CO B-HC C- NO_x D-Soot
 - 7-Efficient operation of catalytic converters requires maintenance of:
 A-Temperature B-Equivalence ratio
 C-(a) and (b) D-Pressure
 - 8-Chemiluminescence technique is used to measure:
 A- NO_x B-CO C- CO_2 D-Smoke intensity
 - 9-Lead compounds were added in gasoline to:
 A-Reduce HC emissions B-Reduce knocking
 C-Reduce exhaust temperature D-Increase power output
 - 10-Rhodium promotes the reduction of:
 A-HC B-CO C- NO_x D-CO and HC
 (10 marks)

With our best wishes

